



Introduction to special issue on smart systems facts, challenges and technologies

Sadek Mahmoud, M., Eltoweissy, M., Curran, K., & Elmedany, W. (2019). Introduction to special issue on smart systems facts, challenges and technologies. *International Journal of Computing and Digital Systems*, 8(2), 85-89. [2]. <https://doi.org/10.12785/ijcds/080201>

[Link to publication record in Ulster University Research Portal](#)

Published in:

International Journal of Computing and Digital Systems

Publication Status:

Published (in print/issue): 03/03/2019

DOI:

[10.12785/ijcds/080201](https://doi.org/10.12785/ijcds/080201)

Document Version

Publisher's PDF, also known as Version of record

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Introduction to Special Issue on Smart Systems Facts, Challenges and Technologies

Magdi S. Mahmoud¹, Mohamed Eltoweissy², Kevin Curran³ and Wael Elmedany⁴

¹ Systems Engineering Department, KFUPM, P.O. Box 5067, Dhahran 31261, Saudi Arabia

² Department of Computer and Information Sciences, Virginia Military Institute, USA

³ Ambient Intelligence & Virtual Worlds Research Group, Ulster University, UK

⁴ Department Of Computer Engineering, University Of Bahrain, Bahrain

Preamble: The University of Bahrain Smart Cities event has been organized in collaboration with the IET-EMEA (IET Europe, Middle East and Africa Regional), IET, (The Institution of Engineering and Technology), UK. Smart Cities relate to the employment of smart technologies and data as the means to solving cities' sustainability challenges and prospering in the future world. We are on the edge of an explosion in cities transforming themselves to be smarter. This can be achieved while relying on and using data and technology to improve a number of sectors.

The main purpose of the event was creating awareness about the future prospects of Smart Cities. The event served as a platform to exchange ideas, prototypes and systems in an international setting. The event's objectives were also to emphasize the role of the University of Bahrain in promoting a smarter kingdom via its consultancy, intellectual forums, publications and innovative solutions. In addition, the event also focused on networking opportunities for research and development related to smart cities. The symposium offered an excellent opportunity for scientists, innovators, and engineers to interact, share experiences and present their latest research with peers in a multidisciplinary engineering background. The symposium venue was at University of Bahrain, and was run for two days, (22- 23 April 2018). The symposium involved both invited speakers (talking about the need for and benefits of smart cities), in addition to academic peer-reviewed papers published by the IET digital library, IEEE Xplore digital library, and indexed by SCOPUS.

This special issue of the International Journal of Computing and Digital Systems (IJCDs), focuses on smart systems research and technologies, and publishes selected papers from the Smart Cities Symposium, whose main theme was "Solutions for a Smarter Economy" (22- 23 April 2018, Manama, Bahrain). The symposium had eight different tracks that cover important aspects related to electrical, computer and electronics engineering. Three members of the technical program review committee reviewed each paper, and the accepted papers were presented during the symposium, only four papers were accepted as extended versions in this special issue. The papers included here offer in-depth discussion and informal exchange of ideas, concepts, and experiences in a wide range of topics related to smart cities, Engineering, IT, AI and other related solutions for future smart cities.

Keywords: Smart Systems, Technologies, Performance Evaluation, Assessment

INTRODUCTION

The accelerated integration and convergence of communications, computing, and control over the last decade has commanded researchers from different disciplines to become involved in the emerging field of distributed networked control systems (DNCS), where the operations of sensors, actuators, and controllers are distributed at different geographical locations and coordinated through information exchanged over communication networks. Some typical



characteristics of those systems are reflected in their asynchronous operations, diversified functions, and complicated organizational structures.

The widespread applications of cyber-physical and/or IOT technologies have been one of the major driving forces for research and development of DNCs. More recently, the emergence of pervasive communication and computing has significantly intensified the effort of building such systems for control and management of various network-centric complex systems that have become more and more popular in micro grids, aerospace systems, tele-operation, and intelligent systems, process automation, computer integrated manufacturing, business operations, as well as public administration.

This special issue, which publishes selected papers from Smart Cities 2018 (SCS2018), includes ten papers that cover different areas related to the theme of the Smart Systems Facts, Challenges, and Technologies. The main contributions of the accepted papers in the SI of SCS2018 are highlighted in the remaining part of this introduction.

Authors of paper [1] provide a concise security evaluation on IoT networks. The paper performs a security evaluation in IoT using a practical approach and provides some recommendations to mitigate some security threats. The paper presents an analysis about the cyber-security in the IoT context of smart homes and smart cities. The focus is on the ZigBee protocol. The main attacks towards the security of an IoT system are described. A real testbed is used to simulate such attacks within the ZigBee protocol. Hence, the authors derived possible countermeasures.

In [2] authors describe the design and implementation of a remote Smart Oil Pipeline Surveillance System (SOPSS), the paper reflects empirical work by describing the development phases of proposed SOPSS, the system could be considered as an IoT application. SOPSS is a monitoring system with visual feature that allows the users to monitor the target objects remotely in a secure and efficient way reducing the effort and resources consumption.

In [3], authors developed an efficient model to determine the Panel Generator Factor (PGF), their model was compared with other models and it was found to be more efficient. The proposed model tested on the IEEE123 bus system. The PV panels added to the IEEE123 bus system.

An implementation of smart medicine dispenser with associated system and GUI development is discussed in [4], the paper is an extension of a previously reported work Smart Medicine Dispenser (SMD) presented at 2018 IEEE 4th Middle East Conference on Biomedical Engineering (MECBME). Authors have comprehensively discussed the design and novelty of smart medication dispenser.

Authors of [5] proposed automated system that provide different services offered in a restaurant and connects the various equipment of this restaurant, in order to simplify and facilitate the work of employees using this system. A content-based recommendation module based on the use of a similarity measure was used to keep track of the client order history in order to suggest or recommend to him similar dishes for his next orders.

Paper [6] provides an overview of a smart energy controller system that proposes a residential air conditioner (RAC) to save the electricity costs using a new algorithm based on DR. The proposed DR algorithm is applied under three strategies. The first strategy considers operation during one day of the week from 12 pm to 12 am, the second strategy considers controlling of thermostat by sensing inside room temperature during 12 pm to 12 am of the day, and the third strategy considers operation of RAC by real time price (RTP) with several cases. The Experimental result of the proposed SEC is compared with each other strategy of EMS. The third strategy provides better results in terms of energy consumption and electricity cost.



Authors of [7] proposed distributed strategy for UAVs formation control and obstacles avoidance using a consensus-based switching topology. This novel approach allows UAVs to keep the desired topology and switch it in the event of avoiding obstacles. A double loop control structure was designed using a back stepping controller for tracking of the reference path, while a Sliding Mode Controller (SMC) was adopted for formation control.

An improved Secure Router Discovery prevention mechanism is proposed in [8]. It is lightweight, integrated and self-regulated to overcome the issues with existing prevention techniques. The primary focus of this research are the assumptions, threat model and design goals of the proposed mechanism. It also outlines the proposed architecture, components of the building blocks of the architecture and the operation of this lightweight mechanism.

Authors of paper [9] presented a model for large-scale automated greenhouse system for more efficient greenhouses. The model is simulated by the GNS simulator. The automated greenhouse system is based on IoT for sensing soil moisture, light, temperature and humidity. They provide a solution for fault tolerant node placement using Menger's Theorem. Simulation of the proposed model carried out and the results suggest the better model of sensor node placement in a greenhouse system.

A Smart Toll Collection System (STCS) is presented in [10]. The STCS technology is specially designed for Bangladesh. Two types of toll collection system which are manual and computerized exist in Bangladesh. Both systems require human operator for toll collection. This however is time-consuming process. With this respect, a smart (fully automated) toll collection system is proposed in this paper.

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Magdi Sadek Mahmoud obtained B. Sc. (Honors) in communication engineering, M. Sc. in electronic engineering and Ph. D. in systems engineering, all from Cairo University in 1968, 1972 and 1974, respectively. He has been a professor of engineering since 1984. He is now a Distinguished Professor at KFUPM, Saudi Arabia. He was on the faculty at different universities worldwide including Egypt (CU, AUC), Kuwait (KU), UAE (UAEU), UK (UMIST), USA (Pitt, Case Western), Singapore (Nanyang) and Australia (Adelaide). He lectured in Venezuela (Caracas), Germany (Hanover), UK ((Kent), USA (UoSA), Canada (Montreal) and China (BIT, Yanshan, USTB). He is the principal author of fifty-two (52) books, inclusive book-chapters and the author/co-author of more than 600 peer-reviewed papers. He is the recipient of two national,

one regional and several university prizes for outstanding research in engineering and applied mathematics. He is a fellow of the IEE, a senior member of the IEEE, the CEI (UK), and a registered consultant engineer of information engineering and systems (Egypt). He is currently actively engaged in teaching and research in the development of modern methodologies to distributed control and filtering, networked-control systems, triggering mechanisms in dynamical systems, cloud-based control systems and cyber-physical systems. He is a fellow of the IEE, a senior member of the IEEE, the CEI (UK), and a registered consultant engineer of information engineering and systems Egypt.



Mohamed Eltoweissy is Department Head and Professor of Computer and Information Sciences at The Virginia Military Institute, USA. He is also a Professor affiliated with The Bradley Department of Electrical and Computer Engineering at Virginia Tech. Eltoweissy also served as Chief Scientist for Secure Cyber Systems at Pacific Northwest National Laboratory. Eltoweissy's current interests crosscut the areas of network security and resilience, cooperative autonomic systems, and networking architecture and protocols. Eltoweissy has over 175 publications in archival journals and respected books and conference proceedings and an extensive funding record. He also served on the editorial board of IEEE Transactions on Computers (the flagship and oldest Transactions of the IEEE Computer Society) as well as other reputable journals. In addition, Eltoweissy is active as an invited speaker at both the national and international levels.

Eltoweissy received several awards and recognition for research, education, service and entrepreneurship, including best paper awards, top placements at Cyber Security competitions, and nomination for the Virginia SCHEV Outstanding Faculty Awards, the highest honor for faculty in Virginia. Eltoweissy is a senior member of IEEE and ACM..



Kevin Curran obtained is a Professor of Cyber Security, Executive Co-Director of the Legal innovation Centre and group leader of the Ambient Intelligence & Virtual Worlds Research Group at Ulster University. He is also a senior member of the IEEE. Prof Curran is perhaps most well-known for his work on cyber security, blockchain and location positioning within indoor environments evidenced by over 800 peer review papers. He is one of the most interviewed technology experts in the UK with over 1000+ interviews in recent years.

<https://kevincurran.org/interviews/>



Wael Elmedany is currently an associate professor of Computer Engineering at University of Bahrain, Kingdom of Bahrain, and senior member of IEEE society. Elmedany holds a PhD degree in Electrical Engineering, Manchester University, UK, 1999; MSc degree in computer communications, Menoufia University, Egypt, 1991; BSc degree in Electronic Engineering, Menoufia University, Egypt 1987. Elmedany was assistant professor of computer communications, department of Electrical Engineering, Cairo University, Fayoum branch, 2000-2005, and assistant professor of electronics and computer communications, in Faculty of Electronic Engineering, Menoufia University, Egypt, 1999-2000. Elmedany was the research and development director of Evara R&D, Egypt, 2001-2003, and general director of Varia IC, Egypt, 2003-2005. He is the founder and managing editor of International Journal of Computing and Digital Systems (IJCDS). He is the founder and organizer of MobiApps, DPNoC, and WoTBD workshops and symposium series. He is also an editor of many journals special issues, member of editorial boards for many international journals, and member of technical program committees of many conferences. He is also reviewer in many international journals and conferences, and acts as chairperson in many conferences. El-Medany has over forty publications in a well-known international conferences and journals, and attended several national and international conferences and workshops. His research interests in ASIC design, FPGA, embedded systems, network on chip, remote monitoring systems, and reconfigurable computing.



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Pekka	Pirinen	University of Oulu	Finland
Peter	Roessler	University of Applied Sciences Technikum Wien	Austria
Philip	Moore	Lanzhou University	P.R. China
Pooya	Taheri	SFU	Canada
Rabiah	Abdul Kadir	National University of Malaysia	Malaysia
Radu	Arsinte	Technical University of Cluj-Napoca	Romania
Raghda	Zahran	Bahrain Polytechnic	Bahrain
Rajanikanth	Aluvalu	Vardhaman College of Engineering	India
Ralph	Turner	Eastern Kentucky University	USA
		Research Centre in Real Time and Embedded Systems	
Ramiro	Samano-Robles		Portugal
Ravindra	Bhat	NMIMS	India
Raza	Hasan	Middle East College	Oman
Renuka	Nagpal	Amity University	India
Rodger	Lea	University of British Columbia	Canada
		Instituto Federal de Educação, Ciência e Tecnologia de São Paulo	
Rodolfo	Meneguette		Brazil
Rodrigo		São Paulo Federal Institute of Education, Science and Technology	
Campos	Bortoletto		Brazil
Román	Lara Cueva	Universidad de las Fuerzas Armadas ESPE	Ecuador
Rong Nan	Chiou	Southern Taiwan University	Taiwan
Rongxing	Lu	University of New Brunswick	Canada
Ronnie	Serfa Juan	Cheongju University	Korea
Rosaura	Palma-Orozco	Instituto Politécnico Nacional	Mexico
Rozmie Razif	Othman	Universiti Malaysia Perlis	Malaysia
Rupa	Chiramdasu	VRSEC	India
Saad	Hasson	University of Babylon	Iraq
Sahar	Ismail	Princess Nourah Bint Abdulrahman University	Egypt
Sandeep	Kakde	Y C College of Engineering	India
Sanjaya			
Kumar	Panda	Veer Surendra Sai University of Technology, Burla	India
Sara	Aldoweesh	King Abdulaziz City for Science and Technology	Saudi Arabia
Sarah	Al-Shareeda	The Ohio State University	USA



Savio	Sciancalepore	Hamad Bin Khalifa University	Qatar
Sergio	Saponara	University of Pisa	Italy
Seyed	Nikouei	Binghamton University	USA
Seyed			
Ebrahim	Esmaeili	American University of Kuwait	Kuwait
Shahrul Azmi	Mohd Yusof	Universiti Utara Malaysia	Malaysia
Shih-Yi	Yuan	Feng Chia University	Taiwan
Siripurapu	Sridhar	LENDI Institute of Engineering and Technology	India
	Siva Rama		
Somayaji	Krishnan	VIT University	India
Sonia	Agrawal	Intel Corporation	USA
Suat	Kasap	American University of the Middle East	Kuwait
Suresh	Subramanian	Ahlia University	Bahrain
Tamseel	Syed	University of Akron	USA
Tanweer	Alam	Samsung India	India
Tharmaraj			
Charlet	Jeaunita	PESIT Bangalore South Campus	India
			United Kingdom (Great
Timothy	Ferris	Cranfield University	Britain)
Toni	Amorim	Universidade Estadual do Mato Grosso	Brazil
		Posts and Telecommunications Institute of	
Tran Trung	Duy	Technology	Vietnam
Tryfon	Theodorou	University of Macedonia	Greece
Tze Hui	Liew	Multimedia University	Malaysia
Usama	Khaled	Aswan University	Egypt
			United Kingdom (Great
Usman	Habib	University of Kent	Britain)
Valentina	Balas	Aurel Vlaicu University of Arad	Romania
van Thuan	Do	Wolffia AS	Norway
Wael	Abdelhameed	University of Bahrain	Bahrain
Wael	El-Medany	University Of Bahrain	Bahrain
Wen-Lin	Yang	National University of Tainan	Taiwan
Wissam	Mallouli	Montimage	France
Yahia	Alkhouday	AlBuraimi University College	Oman
Yang	Wu	Facebook	USA
Yogita	Thakran	Indian Institute of Technology Roorkee	India



Zainab	Alhakeem	Yonsei University	Korea
Zainab	Alansari	University of Malaya	Malaysia
Zouhir	Bahri	University of Bahrain	Bahrain